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(*पहला पुनरीक्षण*)

360 Degree Rotary Emergency Warning Lights/Special Warning Lamps — Specification

(*First Revision*)

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Electrical Equipment and Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1980. In this revision functional requirements such as of photometric and colorimetric have been updated and specified in details, tests such as vibration test, life test, salt spray test, dust tests, resistance to oil test have been omitted.

Emergency warning lights / Special warning lamps are essential safety feature for fitment for special vehicles. These roof mounted rotary emergency warning lights are used on authorized emergency vehicles such as police vehicles, hospital ambulances, fire brigade vehicles and aerodrome vehicles. The light is visible through a dome from all directions in the horizontal plane.

This standard is in line with UNECE Regulation No. 65 ‘Uniform provisions concerning the approval of special warning lamps for power-driven vehicles and their trailers’.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

360 DEGREE ROTARY EMERGENCY WARNING LIGHTS/ SPECIAL WARNING LAMPS — SPECIFICATION

(First Revision)

1 SCOPE

This standard applies to special warning lamps for vehicles of Categories L, M, N, O, and T and for mobile machinery as defined in IS 14272.

2 REFERENCE

The following standard contains provision, which through reference in this text, constitutes provision of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
14272 : 2011	Automotive vehicles — Types — Terminology (*first revision*)

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply:

3.1 Special Warning Lamp — Special warning lamps are lamps, emitting blue or amber light, intermittently for use on vehicles[1].

3.1.1 *Rotating or Stationary Flashing Lamp* — A special warning lamp emitting light intermittently all around its vertical axis (Category T).

3.1.2 *Directional Flashing Lamp* — A special warning lamp emitting light intermittently in a limited angular area (Category X).

3.1.3 *Complete Bar* — A special warning lamp with two or more optical systems emitting light intermittently all around its vertical axis.

3.2 Special Warning Lamps of Different Types

Special warning lamps which differ intrinsically in such matters as:

a) trade name or make;
b) size and form of the coloured cover;
c) optical system;
d) nature of the beam (for example rotating or stationary flashing);
e) colour of the light emitted;
f) light source;
g) light source module; and
h) Whether the special warning lamp has one level (class 1) or two levels (class 2) of intensity.

3.3 Frequency (*f*)

It is the number of flashes or groups of flashes (*see* **D-2.5**) within 1s.

3.4 "On" Time t_H

It is the period of time within which the luminous intensity of the flashing light is superior to 1/10 of the maximum value (peak value) J_m,

3.5 "Off" Time t_D

It is the period of time within which the luminous intensity of the flashing light is less than 1/100 of the maximum value (peak value) J_m, but not more than 10 cd. In the case of groups of flashes the "Off" time shall be evaluated from the last flash of the group to the first flash of the next group;

3.6 "Effective Intensity" J_e

Intensity in a fixed direction for both rotating and stationary flashing type is given by:

J_m : Peak intensity (cd)
C : Time constant, $C = 0 .2$

$$J_e = \frac{J_m}{\begin{array}{c}\mathrm{C}\\ 1+\frac{C}{F.T}\end{array}}$$

T : time of period
F : Form factor $F = \int_0^T \frac{J\mathrm{d}t}{Jm.T}$
J : Instantaneous intensity (cd)

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[1] Police vehicles (flying squads), hospital ambulances, fire brigade vehicle and aerodrome vehicles

3.7 Reference Centre of the Special Warning Lamp

For a rotating or stationary flashing lamp (Category T), the centre of the light source, and for a directional flashing lamp (Category X), the intersection of the axis of reference with the exterior light emitting surface. It should be specified by the manufacturer of the special warning lamp. In the absence of such specification, it means the centre of the light source.

3.8 Reference Axis of the Special Warning Lamp

a) For a rotating or stationary flashing lamp (Category T), a vertical axis passing through the reference centre of the lamp.

b) For a directional flashing lamp (Category X), a horizontal axis parallel to the median longitudinal plane of the vehicle.

c) The manufacturer of the special warning lamp shall indicate the position of the special warning lamp in relation to the reference axis.

3.9 Measuring Directions

3.9.1 The effective intensities of rotating or stationary (Category T) lamps shall be determined in the directions within an angle of 360° around the reference axis of the special warning lamp.

3.9.1.1 In a horizontal plane perpendicular to the reference axis and passing through the reference centre of the special warning lamp.

3.9.1.2 In cones, the generating lines of which produce with the above mentioned horizontal plane angles, the values of which are indicated in the table in **D-3.2**.

3.9.2 The effective intensities of directional flashing lamps (Category X) shall be measured in the directions indicated in **D-3.3**.

4 APPLICATIONS FOR TYPE APPROVAL

4.1. The application for approval of a special warning lamp shall be submitted by the owner of the trade-name or mark or by his duly authorised representative. It shall specify whether the special warning lamp is intended to emit Amber (A), Red (R) or Blue (B) light, whether it falls within the directional flashing lamp (X) category, or whether it falls within the rotating or stationary flashing lamp (T) category, and whether it has one level of intensity (Class 1), or two levels of intensity (Class 2). The requisite details are given in Annex A.

4.2 For each type of special warning lamp, the application shall be accompanied by:

a) Drawing, in triplicate, in sufficient detail to permit identification of the type of the special warning lamp and showing in what geometrical position the special warning lamp shall be mounted on the vehicle;

b) A brief technical description stating in particular the light source provided by the manufacturer of the special warning lamp and, where applicable, the electronic control unit(s), the ballast(s) or the light control gear(s) or the light source module and the light source module specific identification code;

c) For a special warning lamp having two levels of intensity, an arrangement diagram and a specification of the characteristics of the system ensuring two levels of intensity;

d) For a special warning lamp device which is comprised of more than one separate unit, the intended geometrical arrangement when installed on the vehicle including the specification of each unit and the maximum distance between the units;

e) Two samples, in principle for a rated voltage of 12 V and for only one colour, and eventually two other samples for any other rated voltage in the case where an application is submitted simultaneously or subsequently for approval of special warning lamps of other rated voltages. In this case, it is sufficient to carry out tests according to **6.5**; and

f) Two samples of the cover, provided that the construction of the special warning lamp with exception of the colour of the cover remains unchanged and the approval may be extended simultaneously or subsequently for special warning lamps of another colour. In this case, it is sufficient to carry out the photometric and colorimetric tests.

5 MARKING

5.1 Special warning lamp shall clearly, legibly and indelibly be marked with the following:

a) Trade name or mark of the manufacturer;

b) The rated voltage;

c) In case of a special warning lamp device which is comprised of more than one separate unit, in brackets an identification mark for the specification of the individual separate unit followed by a "/" and the indication of the total number of separate units to meet the requirements;

d) In case of a lamp with a replaceable light source, the category of light source according to the relevant Indian Standard;

e) In case of a lamp with a non-replaceable light source or a light source module, the rated wattage; and

f) In case of directional flashing lamps having a "wide angle effect" shall bear an arrow indicating the "wide angle" side and the mounting position. The arrow showing in which position the device has to be installed shall be directed outwards from the vehicle when correctly installed.

5.2 BIS Certification Marking

5.2.1 Emergency warning lights / special warning lamps may also be marked with the Standard Mark.

5.2.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Standards made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

6 DESIGN CONSTRUCTION AND GENERAL REQUIREMENTS

6.1 The special warning lamps shall be so designed and constructed that in normal conditions of use, and notwithstanding the vibrations to which they may be subjected in such use, their satisfactory operation remains assured and they retain the prescribed characteristics. The special warning lamps shall be so designed and constructed that the relevant requirements with regard to voltage higher than 50 V are fulfilled.

6.2 The special warning lamp shall be so designed that after it has been mounted correctly on the vehicle, no maladjustment is possible. The special warning lamp shall be powered directly from the voltage supply network of the vehicle by direct connection or usual connectors (for example cigarette lighter plug).

6.3 When a non-replaceable light source is used it shall be permanently fixed to the special warning lamp.

6.4 The design of the light source module(s) shall be such that even in darkness the light source module(s) can be fitted in no other position, but the correct one. The light source module(s) shall be tamperproof.

6.5 In the case of a system that uses a special power supply, or a dedicated power supply, or light source control gear shall be part of special warning lamp.

6.6 The frequency f, the 'On' time t_H and the 'Off' time t_D shall correspond to the values indicated in the table in **D-3.1**. They shall be measured at an ambient temperature of 23 ± 5°C and with voltages at the terminals of the device which are between 90 to 115 percent of the rated voltage. Moreover, starting and correct functioning of the special warning lamp shall remain assured at temperatures between – 20º C and +50°C or if the special warning lamp is exposed to rain test, in accordance with Annex C. Under those conditions, 1 min after a voltage equal to 90 percent of the rated voltage has been applied; the frequency shall remain between 2 and 4 H_Z.

6.7 A rotating or flashing special warning lamp device of Category T may consist of more than one optical system. In this case, the requirements of **D-4**, shall be met. The lamp manufacturer shall supply mounting information to ensure that the various units are correctly mounted on a vehicle.

7 PHOTOMETRIC REQUIREMENTS

The special warning lamps shall comply with the requirements prescribed in Annex D.

8 CHECKING THE COLOUR OF THE SPECIAL WARNING LAMP

8.1 The colour shall comply with the colorimetric boundaries prescribed in Annex B.

8.2 The colorimetric characteristics of the light emitted, expressed in CIE chromaticity co ordinates, shall be evaluated using the light source as designed, working at the voltage as specified in **D-2.2**.

8.3 In case of a special warning lamp employing a Xenon flash tube, as an alternative the chromaticity co-ordinates may be deduced from the spectral distribution of the transmission of the cover and the transmission or reflection of any other optical effective elements which could impair the colour of the special warning lamp. The calculation then shall be based on a luminous source with a relative spectral distribution as given in Annex E.

9 MODIFICATION OF A TYPE OF SPECIAL WARNING LIGHT FOR MOTOR VEHICLES AND EXTENSION OF APPROVAL

9.1 Every modification of a type of special warning lamp shall be notified to the testing agency which granted the type approval. The testing agency may then either,

a) consider that the modifications made are unlikely to have appreciable adverse effects and that in any event the special warning lamp still complies with the requirements, or

b) require a further test report from the technical services responsible for conducting the tests.

10 CONFORMITY OF PRODUCTION

Special warning lamps approved under this standard shall be so manufactured as to conform to the type approved by meeting the requirements set forth in **6**, **7** and **8**.

ANNEX A

(*Clause* 4.1)

DETAILS TO BE SUBMITTED DURING TYPE APPROVAL

A-1 Special warning lamp/rotating/stationary flashing lamp/directional flashing lamp/ complete bar/blue/ amber/red.

A-2 Special warning lamp has one/ two levels of intensity

Special warning lamp consists of .... separate units.

A-3 For special warning lamps having two levels of intensity, indicate the system used to obtain increased intensity at daytime

A-4 Used light source,

a) category of filament lamp or;
b) gas discharge light source or;
c) LED Yes/ No or;
d) Light source module: Yes / No
e) Light source module specific identification code: ....

A-5 Rated voltage of special warning lamp ....

A-6 Trade-name or mark ....

A-7 Manufacturer's name and address ....

ANNEX B

(*Clause* 8.1)

TRICHROMATIC COORDINATES FOR THE LIGHT EMITTED THROUGH THE AMBER OR BLUE FILTERS CONSTITUTING THE COVERS OF SPECIAL WARNING LAMPS

B-1 Under the conditions of **8**, the trichromatic co-ordinates of light emitted through the filters used for special warning lamps shall lie within the following boundaries:

B-1.1 Amber

a) Limit towards green: $y \leq x - 0.120$
b) Limit towards red: $y \quad 0.390$
c) Limit towards white: $y \quad 0.790 - 0.670\,x$

B-1.2 Blue

a) Limit towards green: $y = 0.065 + 0.805\,x$
b) Limit towards white: $y = 0.400 - x$
c) Limit towards purple: $y = 1.667x - 0.222$

B-1.3 Red

a) Limit towards purple: $y \quad 0.980 - x$
b) Limit towards yellow: $y \quad 0.335$

NOTE — 'Amber' corresponds to a specific part of the "yellow" zone of the triangle of CIE colours.

ANNEX C

(*Clause* 6.6)

PROCEDURE FOR THE RAIN TEST

C-1 A sample of the special warning lamp, fitted in its normal operating position, with all the drainage apertures open, if they exist, shall be subjected to a precipitation of 2.5 mm of water per min, the water being directed at an angle of 45° and from a nozzle producing a full conical jet.

C-2 During the test, the device shall turn on its vertical axis at a rate of 4 turns/min.

C-3 The test shall last for 12 h continuously after which the water jet shall be stopped.

C-4 One hour later, the sample shall be examined and shall be regarded as having passed the test if the accumulated volume of water does not exceed 2 cm^3.

ANNEX D

(*Clauses* 3.3, 3.9.1.2, 3.9.2, 6.6, 6.7, 7 *and* 8.2)

PHOTOMETRIC REQUIREMENTS

D-1 GENERAL

D-1.1 Measurements of the photometric characteristics shall be taken at a distance of at least 25 m. The angular diameter of the photoelectric receiver as seen from the special warning lamp shall be 10 min or arc maximum. The response time of the photometric system shall be adequate to the rising time of the signal to be measured.

D-1.2 For special warning lamps having one level of intensity (class 1), the 'by night' level shall apply. For special warning lamps, having two levels of intensity (class 2), measurements shall be carried out for each of the two levels. The effective luminous intensities in various directions shall be as specified in **D-3.2**, and **D-3.3**.

D-1.3 If a filament lamp is used that shall be a standard filament lamp as provided for in automotive filament standard corresponding to a lamp of the category specified for the special warning lamp.

D-2 LIGHT SOURCE CONDITIONS FOR TEST

D-2.1 In the case of replaceable light sources a standard lamp shall be used.

D-2.2 All measurements on lamps equipped with replaceable or non-replaceable light sources (filament lamps, gas discharge light sources and other) shall be made at 6.75 V, 13.5 V or 28.0 V, respectively. In the case of a system that uses a special power supply, or a dedicated power supply, or light source control gear, the voltage declared by the manufacturer shall be applied to the input terminals of that power supply. Unless otherwise specified 6.75 V, 13.5 V or 28 V, as applicable shall be used.

D-2.3 In the case of filament lamps it is allowed to make the measurements with a standard filament lamp at reference flux conditions nearly at 12 V and recalculate the measured values by a factor, which is determined with this standard filament lamp at 13.5 V, if applicable.

D-2.4 For any lamp equipped with non-filament light source(s), the luminous intensities measured after 1 min and after 30 min of operation shall comply with the minimum and maximum requirements. The luminous intensity distribution after 1 min of operation can be calculated by applying the ratio achieved at HV between 1 min and 30 min of operation.

D-2.5 If the emitted light of a special warning lamp consists of groups of several flashes, the time distance Δt between the immediately following flashes must be very short. If the peak to peak distance Δt is less or equal to 0.04 s, then the pulses in between are evaluated as one flash. If this distance Δt is longer only the flash with the highest effective intensity is valid. Moreover, the period is limited depending on the ratio between the effective intensities of the flashes within a group (I_H= maximum effective intensity of the highest peak, I_L = maximum effective intensity of the lowest peak) as follows:

a) In case

$$\frac{I_H}{I_L} \rangle 10 \qquad \text{Then } \Delta t \text{ (s) } \langle \frac{I}{3f}$$

b) In case

$$1 \langle \frac{I_H}{I_L} \langle 10 \qquad \text{Then } \Delta t \text{ (s)} \langle \frac{1}{f\,(5.50 - 0.25\frac{I_H}{I_L})}$$

D-3 FREQUENCY, TIME AND INTENSITY OF THE EMITTED LIGHT

D-3.1 The frequency, the "ON" time and the "OFF" time shall be as specified below:

		Colour Blue or Amber
		Rotating System or Flash Light Sources (Categories T and X)
Frequency f (Hz)	*Ma.*	4
	Min	2
'ON' time t_H (s)	*Max*	$0.4/f$
'OFF' time t_D (s)	*Min*	0.1

D-3.2 The effective luminous intensities (J_e) within the relevant vertical angles and a horizontal angle of 360° around the reference axis for a special warning lamp (Category T) shall be as specified below:

D-3.2.1 In the case of a special warning lamp device which is comprised of more than one separate unit, the geometrical arrangement(s) as installed at the vehicle seems to be acceptable, if the partial light distribution of each single separate unit is overlapping with each adjacent partial light distribution inside a horizontal angular range of 360° and in a vertical angular range as specified for the relevant category in a geometrical position corresponding to a distance of 20 m, from the vehicle on a vertical plane that is perpendicular to the longitudinal axis of the vehicle and located midway between the lamp units on a side of the vehicle.

D-3.3 The effective luminous intensities in the reference axes for a directional flashing lamp (Category X) shall be as specified below:

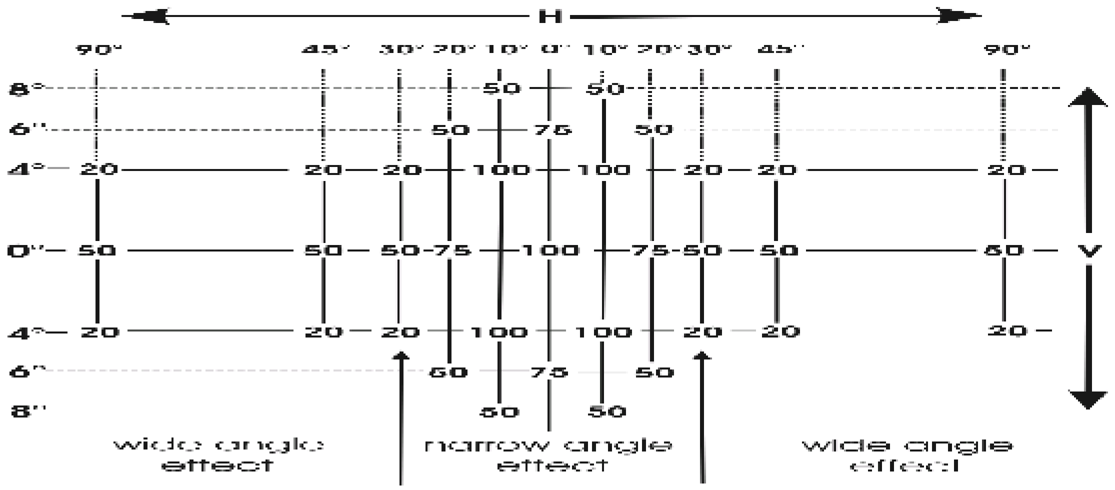
D-3.3.1 Table of standard light distribution for special warning flash lamp (Category X)

D-3.3.2 In the case of a special warning lamp device of Category X which comprises of more than one separate unit, the geometrical arrangement(s) as installed on the vehicle, is (are) acceptable when the partial light distribution of each single separate unit is overlapping with each adjacent partial light distribution inside the horizontal and vertical angular range specified for the Category X.

D-3.3.2.1 The direction H = 0° and V = 0° corresponds to the reference axis. (On the vehicle it is horizontal, parallel to the median longitudinal plane of the vehicle and oriented in the required direction of visibility). It passes through the centre of reference. The values shown in the table in **D-3.3** give, for the various directions of measurements, the minimum intensities

Category T					
	Vertical Angle		*Colour*		
			Blue	Amber	Red
Effective Luminous Intensity J_e, *Min*	0°	by day	120	230	120
		by night	50	100	50
	±4°	by day	60	–	60
		by night	25	–	25
	±8°	by day	–	170	–
		by night	–	70	–
Effective Luminous Intensity $J_{e,}$ *Max*	±2°	by day	1 700		
		by night	700		
	±8°	by day	1 500		
		by night	600		
	Outside the above areas	by day	1 000		
		by night	300		

Category X					
	Reference Axes		*Colour*		
			Blue	Amber	Red
Effective Luminous Intensity $J_{e,}$ *Min*	H = 0° V = 0°	by day	200	400	200
		by night	100	200	100
Effective Luminous Intensity $J_{e,}$ *Max*	H = ±10° V = ±4°	by day	3 000	1 500	3 000
		by night	1 500	600	1 500
	H = ±20° V = ±8°	by day	1 500	1 500	1 500
		by night	600	600	600
	Outside the above areas	by day	1 000	1 000	1 000
		by night	300	300	300



Minimum horizontal angular range of category ‘narrow angle effect’ is 30° left to 30° right and for category ‘wide angle effect’ 90° directed outwards the vehicle and 30° to the inside.

as a percentage of the minimum required in the axis for each lamp (in the direction H = 0° and V = 0°).

D-3.3.2.2 Within the field of light distribution schematically shown as a grid in **D-3.3.1**, the light pattern should be substantially uniform, that is the light intensity in each direction of lowest minimum value being shown on the grid lines surrounding the questioned direction as a percentage.

D-4 INTEGRATION OF TWO OR MORE OPTICAL SYSTEMS

If two or more optical systems are integrated in one special warning lamp, this unit has to comply with the requirements given in **D-4.1** to **D-4.3**.

D-4.1 Each optical system shall be in accordance with the requirements of this Annex within the horizontal angle which is not covered by one of the other optical systems. Furthermore, in each required direction at least one optical system shall be effective corresponding to the requirements of this Annex.

D-4.2 If a special warning lamp contains two or more optical systems, all the optical systems shall work in phase. This applies only to each half of a complete ‘bar’ which is designed to extend on the width of the vehicle.

D-4.3 As long as the efficiency of the special warning lamp is to be secured all around the car a detection of the failure of a part of a special warning system shall exist on the car. If it is designed by the special warning lamp manufacturer this detection shall be checked during the approval procedure.

ANNEX E

(*Clause* 8.3)

XENON RELATIVE SPECTRAL DISTRIBUTION

λ	$S_e\,\lambda$ *rel*	λ	$S_e\,\lambda$ *rel*	λ	$S_e\,\lambda$ *rel*	λ	$S_e\,\lambda$ *rel*
380	74.5	480	94.6	580	77.7	680	73.1
385	73.8	485	87.7	585	77.3	685	80.4
390	79.5	490	86.9	590	76.2	690	77.7
395	96.1	495	83.8	595	75.4	695	70.0
400	84.2	500	77.3	600	73.1	700	67.3
405	83.1	505	76.2	605	72.3	705	68.8
410	83.8	510	76.2	610	72.7	710	76.9
415	82.7	515	76.5	615	75.4	715	74.2
420	87.3	520	76.9	620	76.2	720	67.7
425	81.5	525	77.3	625	73.5	725	70.8
430	80.0	530	77.3	630	73.5	730	78.5
435	81.9	535	77.3	635	71.2	735	77.3
440	83.8	540	76.9	640	69.2	740	76.2
445	80.8	545	76.9	645	71.2	745	72.3
450	98.5	550	76.5	650	71.2	750	72.3
455	80.0	555	76.5	655	68.8	755	79.2
460	91.5	560	76.2	660	68.8	760	90.1
465	97.7	565	76.5	665	70.4	765	—
470	100.0	570	76.9	670	70.4	770	—
474	97.7	575	77.3	675	71.2	775	—

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